

### **REMARKS**

Applicant notes with appreciation Examiner's considered withdrawal of the prior rejections U.S.C. §103(a) over Towler et al. (US 6,409,974) in view of Holland et al. (US 6,572,837).

The following remarks are submitted as fully responsive to the Office Action of November 4, 2009.

Claims 16-22, 24-25, and 27-28 are pending. Claims 29 and 30 are new. Claims 29 and 30 find support in claims 16 and 28 as filed, as well as the specification at page 12, lines 5-8. As such, no new matter is added by way of new claims 29 and 30.

Currently pending claims 16-22, 24-25, and 27 stand rejected under 35 U.S.C. §103(a) over Towler et al. (US 6,409,974) in view of Autenrieth (US 6,423,435).

In addition, claim 28 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Towler et al. in view of Autenrieth and further in view of Thompson (US 5,281,253).

Reconsideration and withdrawal of all rejections is respectfully requested on the basis that Trowler teach away from using a hydrogen purification membrane as per Autenrieth.

The basis of the rejection is that Towler teaches all limitations of pending independent claim 16 with the exception that "Towler fails to teach that hydrogen is passed through a membrane to thereby separate the hydrogen from the raffinate stream after the water gas shift reaction." (Paper No. 20091031, page 4, first paragraph.) To bolster the deficiencies in Towler, the outstanding Office Action cites Autenrieth as teaching "a method of making hydrogen in a fuel cell system arrangement (col. 1) wherein an effluent from a reformer is sent to a membrane reactor comprising a water gas shift reaction for the purpose of generating additional hydrogen. (col. 4)." (Paper No. 20091031, page 4.) In sum, the outstanding Office Action asserts that the

claimed process is taught by the combination of Towler and Autenrieth because Towler teaches reforming endothermic reforming reaction and Autenrieth teaches purification of hydrogen by subjecting the product of a first hydrogen production reaction to a water-shift reaction in contact with a hydrogen permeable membrane.

Towler teaches away from using a hydrogen purification membrane for the final purification of hydrogen for subsequent use with a fuel cell as in the subject claims and as in Autenrieth. It is improper to combine references where the references teach away from their combination. *In re Grasselli*, 713 F.2d 731, 743, 218 USPQ 769, 779 (Fed. Cir. 1983). A prior art reference teaches away from a claimed invention if the cited prior art “criticize[s], discredit[s], or otherwise discourage[s] the solution claimed.” *In re Fulton*, 391 F.3d 1195 (Fed. Cir. 2004).

Towler teach that a hydrogen product stream should be saturated with water as in the absence of water saturation the PEM membrane will dry out. Towler states “the cooling of the shift reactors by direct contact with water spray provided the product hydrogen stream at saturated conditions which is desirable to prevent the drying out of the PEM membrane.” (col. 3, lines 47-50.) One of ordinary skill in the art recognizes that a “conventional hydrogen separating membrane” (Autenrieth, col. 4, lines 44-45) functions in such a way that it is impermeable to both water and CO gas. As such, the hydrogen product of Autenrieth is absolutely dry upon leaving the final stage of production. This dry hydrogen stream would dry out and damage the PEM membrane in the fuel cell as per Towler. In this way Towler criticizes and discourages using a system or membrane reactor that prevents a water saturated hydrogen product from forming, thus, damaging the fuel cell. As Towler both teaches away from combination with Autenrieth, and from the claimed invention, Applicant submits that any *prima facie* case of

obviousness is rebutted. Additionally, it is noted that the device of Autenrieth operates with an adiabatic reactor only and requires compressed air pressurization that represent unneeded equipment and complexity.

Overall, claim 16 recites a process that is both discredited and discouraged by the cited prior art. In further support of the distinctions between the claimed process and that of Towler, Applicant hereby incorporates by reference the remarks made of record 4 May 2009.

With respect to the rejection of claim 28 as unpatentable over Towler in view of Autenrieth and Thompson, claim 28 recites that it is the feedstock that is regulated in response to hydrogen pressure, not the reformat product. Thompson is directed to regulating the pressure immediately upstream of the membranes. In contrast, the sensor 38 control of claim 28 does not adjust the pressure upstream of the membrane reactor, instead the sensor is used to adjust the rate of feedstock (fuel) entering the upstream reformer "in response to the downstream requirements of, for instance, a fuel cell." [0034] As such, Thompson fails to teach or suggest the claimed pressure monitoring linked to feedstock flow rate. Thus, claim 28 has an independent basis of patentability.

Applicant submits that pending claims 17-22, 24, 25, 27 and 28, each of which depend from claim 16, are allowable as dependent from claim 16 believed to be in allowable form and directed to patentable subject matter. In light of the above remarks, reconsideration and withdrawal of the rejection as to claims 16-22, 24, 25, 27 and 28 as unpatentable over Towler in view of Autenrieth alone or in combination with Thompson is respectfully requested.

**Remarks directed to new claims 29 and 30**

New claim 29 also recites that the rate of the feedstock entering the reactor is adjusted in response to the pressure of the purified hydrogen. Applicant incorporates the remarks *supra* with respect to claim 28 as equally applicable to claim 29 or the reaction being an endothermic reactor per claim 30.

Overall, the cited prior art combination fails to teach or suggest all elements of new claim 29. As such, Applicant requests passing new claim 29 to allowance.

**Summary**

Claims 16-22, 24, 25, 27, 28 and new claim 29 are pending with entry of this amendment. Reconsideration and withdrawal of the rejections as to all claims and passing of this application to allowance are requested.

The Director is hereby authorized to charge any deficiency in the fees filed, asserted to be filed or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to our Deposit Account No. 07-1180.

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Respectfully submitted,

By \Avery N. Goldstein\\_\_\_\_\_  
Avery N. Goldstein, Ph.D.  
Registration No.: 39,204  
GIFFORD, KRASS, SPRINKLE, ANDERSON  
& CITKOWSKI, P.C.  
2701 Troy Center Drive, Suite 330  
Post Office Box 7021  
Troy, Michigan 48007-7021  
(248) 647-6000  
Attorney for Applicant